

DOCUMENT RESUME

ED 050 621

24

FL 002 197

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TITLE Relationship Between Musical Aptitudes and
Second-Language Learning. Final Report.
INSTITUTION Office of Education (DHEW), Washington, D.C. Bureau
of Research.
BUREAU NO BR-8-D-057
PUB DATE May 70
GRANT OEG-4-8-080057-0047-057
NOTE 58p.
EDRS PRICE MF-\$0.65 HC-\$3.29
DESCRIPTORS Acoustics, Aptitude Tests, Articulation (Speech),
Basic Skills, *Educational Experiments, Language
Fluency, Language Patterns, Language Rhythm,
Language Skills, *Linguistic Performance, Listening
Comprehension, *Music Theory, Pronunciation, *Second
Language Learning, *Spanish, Speech Skills, Verbal
Ability

ABSTRACT

This study explores the relationships between a child's discriminatory abilities in the areas of pitch, intensity, rhythm, timbre, and tonal memory and his capacity to comprehend and speak the Spanish language. The Spanish accent is analyzed on the basis of intonation, stress, sinalepha, and phone production. These factors were tested both in isolated words and on contextual material intended to approximate the conditions of free speech. Comprehension was evaluated by means of an objective, multiple-choice listening test. The results of the investigation indicate a strong relationship between discriminatory musical abilities in pitch, intensity, rhythm, timbre, and tonal memory and in achievement of a Spanish accent. The methods, findings and analysis, and discussions and conclusions of the experiment are described in this report. Frequent use is made of statistical data in numerous tables. A bibliography and sample test materials are provided. (Author/RL)

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Final Report
OE Project No. 8-D-057
OE Grant No. 4-8-080057-0047-057

Relationship Between Musical Aptitudes
and
Second-Language Learning

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March 1970

The Research reported herein was performed pursuant to a grant of the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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SUMMARY

The present investigation explores the relationships between a child's discriminatory abilities in the areas of pitch, intensity, rhythm, timbre, and tonal memory; and his capacity to comprehend spoken Spanish and to acquire native-like accent in the language. Spanish accent is analyzed on the bases of intonation, stress, sinalepha, and phone production. These five factors were tested both in isolated words and in contextual material intended to approximate the conditions of free speech. Comprehension was evaluated by means of an objective (multiple choice) listening test. Sex and I.Q. factors were considered for all subjects, bringing to 16 the original total of variables involved. The difference between the mean scores for boys and girls was not significant and was thus ignored in subsequent analyses.

The decision to work with elementary school-aged children rather than with adolescents or adults gave rise to problems not encountered with older subjects, but it was felt that the potential value of information obtained from younger subjects justified the difficulties involved, since both practical experience and experimental evidence indicate that the ability to acquire native-like accent in a second language decreases significantly with increasing chronological age. The average age of the subjects was approximately ten years (fifth grade).

The principal investigation described in this report was preceded by a pilot study designed to establish sample sizes and testing procedures and to instruct the linguistics raters who would judge the oral performance of subjects involved in the final study. Data obtained in the pilot indicated that 75 subjects would constitute an adequate sampling. In fulfillment of an a priori condition established for the investigation, no data were retained for any subject having significant previous exposure to Spanish. In a further attempt to exclude interference from extraneous factors, subjects were exposed to spoken Spanish only, and in order to minimize any variation in performance that might result from differences in accent, presentation of materials, and teacher effectiveness, all subjects were taught by the same instructor.

The Seashore Measures of pitch, intensity, rhythm, timbre, and tonal memory were administered to all subjects. After a six-week period of audio-lingual instruction in Spanish (thirty minutes per child per school day, for a

total of fifteen hours per subject), language production and comprehension were tested for all subjects.

The results of this study indicate a rather strong relationship between discriminatory musical abilities in pitch, intensity, rhythm, timbre, and tonal memory, and achievement of Spanish accent. With one exception, all of the correlations between musical abilities and Spanish accent achievement are positive and many of them are statistically significant. Because all of the musical ability measures except pitch are highly significantly correlated with I.Q., the partial correlations with respect to I.Q. between musical ability and Spanish accent achievement are of more interest than the zero-order correlations.

Considering these partial correlations, timbre and phones both in context and in isolation are strongly related (.01 level), as are pitch and stress in isolation. There are a number of other statistically significant though less strong relationships (.05 level): pitch with sinalepha and phones in isolation; intensity with intonation in isolation; rhythm with stress and sinalepha in isolation; timbre with intonation in context; and stress in context and tonal memory with phones in isolation.

The correlations between I.Q. and Spanish accent achievement measured in context are larger, in general, than these correlations when Spanish accent achievement is measured in isolation; thus the effect of partialling with respect to I.Q. is greater, in general, for correlations involving Spanish accent when measured in context than when measured in isolation. This is consistent with the greater importance of memory in the contextual material.

Spanish comprehension score is not strongly related to I.Q., musical abilities or Spanish accent measured in isolation, but is strongly related to Spanish accent measured in context. This seems to indicate that there is an ability to comprehend and speak Spanish in context that is largely independent of I.Q. This is confirmed by the fact that the Spanish accent measures in context are highly intercorrelated in all six cases, even after partialling with respect to I.Q., as are the Spanish accent measures in isolation; correlations between the same aspect of Spanish accent measured in context and in isolation are much lower, and none is significant at even the .05 level after partialling with respect to I.Q.

The overall relationship between the musical abilities variables and the Spanish accent achievement variables

is highly significant as indicated by canonical analysis. The variables contributing most strongly to this relationship are the musical abilities variables pitch and timbre and the Spanish accent achievement variables intonation and sinalepha in context and stress and phones in isolation. This overall relationship is consistent with the zero-order and partial correlations and provides an interesting composite analysis of these relationships. The musical abilities variables did not provide a significant discriminant function for predicting three groups partitioned on the basis of total Spanish accent achievement score. This corresponds to the fact that total Spanish accent achievement score is in fact continuous and that the measures of it in this study range widely within each of the groups. The consistent variation of the means for the musical abilities variables with respect to Spanish achievement group is apparently a reflection of a basically continuous relationship, as are the relatively constant correlations between the musical abilities scores and total Spanish achievement scores compared across Spanish achievement groups.

Further research is needed to establish the generality of these results with respect to other languages. While it is obviously not possible to extrapolate the results of experimentation with a single language to languages in general, the rather close relationship found to exist between certain musical acuities and Spanish learning in young subjects suggests the possibility that music and second-language learning may, during early childhood and over a protracted time period, be mutually reinforcing. With regard to older students--adolescents and young adults of college age--it would seem that the study of music and languages might well be regarded as complementary fields of endeavor. It has been the authors' observation that guidance counselors working with these age groups often stress to the person manifesting interest in both areas (a not uncommon situation) the need for choosing between them, when in fact the two might very profitably be pursued conjointly.

INTRODUCTION

The question of a possible relationship between certain abilities regarded as fundamental to good musicianship and the acquisition of accent in a second language (i.e., any language not native to the learner) is one often debated among teachers and other professionals in the language field, but about which until recently there existed little concrete experimental information; and none of the reported studies dealing with the matter has concerned itself with youngsters of elementary school age. Yet it is precisely during these early years that psychological and physiological characteristics are most favorable to the acquisition of native-like accent in a second language,¹ and those factors related to accent are the ones most likely to correlate positively and significantly with musical aptitudes.

It was the aim of the investigation discussed in this paper to attempt to discover whether there does in fact exist any such relationship between a child's discriminatory abilities in the areas of pitch, intensity, rhythm, timbre, and tonal memory, and his capacity to achieve in the area of Spanish accent and to comprehend spoken Spanish. (The choice of Spanish as the language of instruction was arbitrary. Additional research involving other languages will be required to corroborate any accurate generalization. There is, for example, evidence in the Dorcus, Mount and Jones study² that pitch discrimination, a factor found by previous studies to be a significant factor in the

¹That children "learn" a second language better and/or faster than adolescents and adults is questionable. John B. Carroll, in his article "Wanted: A Research Basis for Educational Policy on Foreign Language Teaching" states, "If anything children may be slower. The important way in which children seem to have an advantage over adults or even adolescents is the ease with which they can learn a native-like pronunciation of the foreign language--without the extensive pronunciation drills and phonetic explanations which older people seem to need in order to achieve acceptable pronunciation." (Harvard Educational Review, XXX, p. 132.)

²R. M. Dorcus, G. E. Mount, and M. H. Jones, "Construction and Validation of Foreign Language Aptitude Tests," U.S. Dept. Army, AGO-PRB, Personnel Research Board Report, No. 993 (June, 1952).

acquisition of French accent, may not be equally meaningful for Russian, Hungarian, Serbo-Croatian, Arabic, Japanese, and Mandarin Chinese.)

It should be stressed that the area under investigation in the present study is limited to accent; misunderstandings regarding the nature of second-language learning (and by extension, second-language teaching) have sometimes been perpetuated through failure to distinguish clearly among the various skills involved in successful language production. Thus, one occasionally meets with the assertion that language learning is apparently unrelated to general intelligence. Clearly, such a statement is a distortion; for while there has in the past been little evidence to support the contention that intelligence is related in any significant way to achievement of good accent, there is a large body of responsible research which indicates that overall achievement in learning a second language (which ultimately must involve the ability to deal in abstractions) is strongly related to verbal intelligence and, to a lesser extent, to reasoning. To make any useful statement about language learning, then, one must separate the sensory aspect of the activity from the intellectual and the motor. It is with the sensory that this investigation is primarily concerned, realizing that the sensory is but one part of the very complex question of second-language learning ability.

Among those investigations which have dealt with one or more of the questions involved in the present study, the following are especially pertinent. Some of the earliest work reported in the area is that of Dexter who, in two successive investigations, attempted to examine the relationship between pitch discrimination and accent. The first of these, an account of which appears in the April, 1934, issue of the Journal of Applied Psychology, attempted a broad correlation between pitch discrimination and tonal memory as assessed by the Seashore Measures of Musical Talent³ and accent achieved in French, German, and Spanish. However, the relatively small number of subjects available in the last two resulted in the study's limiting itself primarily to a consideration of French.

³Developed and published by Carl E. Seashore in 1919 and revised in 1939, the Measures are a standard instrument in the field of music psychology.

Two of the Seashore Measures of Musical Talent, those for Pitch Discrimination and for Tonal Memory, were given to an unselected group of 118 upper class students at Agnes Scott College, all but two of whom had had French in college. (Practically all had also had two years of French in high school.) About 25 had had German also and about 20 had had Spanish. Ratings as to pronunciation and accent of each individual tested were obtained from members of the French, German, and Spanish departments. These ratings were in five gradations; 1 being high, 3 average, and 5 low, with 2 and 4 intermediary steps. There were 95 students for whom French accent ratings were secured, rated by three members of the department, but only 20-25 in Spanish and German, so the study has concerned itself mainly with French.⁴

The results of the Tonal Memory⁵ test are not discussed since it was concluded that this factor made "no apparent contribution toward accent."⁶ Also included in this study were investigations of the relationship between intelligence and accent ratings, between pitch discrimination and number of years of study, between intelligence and pitch discrimination, and between certain personality traits and accent achieved. The investigators reported a "slight relation" between pitch and number of years of study, a "slight relation between accent and pitch discrimination," and an "appreciably higher median in pitch discrimination for the group rated above the average in accent in French and Spanish than for those rated average or lower," and that "...people with low ability in pitch discrimination are not rated high in accent, nor do they take more than two years

⁴Emily S. Dexter and Katherine T. Omwake, "The Relation Between Pitch Discrimination and Accent in Modern Languages," Journal of Applied Psychology, XVIII (1934), p. 267.

⁵There are six divisions in the Seashore: Pitch, Intensity, Rhythm, Timbre, Tonal Memory, and Time. Tonal Memory measures the accuracy with which a subject recalls musical phrases of three, four, or five successive tones.

⁶Dexter and Omwake, p. 267.

of college French."⁷ This last finding parallels those in studies undertaken in the field of music education which have shown that those who test poorly in the area of pitch discrimination rarely pursue music study beyond the beginner stage.⁸

The second of Dexter's studies, reported in a subsequent issue of the Journal of Applied Psychology, restricted itself to a consideration of the relation between pitch discrimination, intelligence, and accent in French, but subjects were 514 girls drawn from two different high schools. According to the investigator, "The findings of this study are gratifyingly similar to those of the earlier investigation. High school students to an even greater extent than college students tend to be rated high, average or low in French accent according as their ability to discriminate pitch varies from high to low."⁹ Among the conclusions drawn from this investigation are the following:

- a. There is a good correlation between pitch discrimination and accent rating...
- b. Comparatively low intellectual ability for high school work accompanied by good pitch discrimination seems to result in reasonably successful work in French; whereas correspondingly low intelligence accompanied by low ability to discriminate pitch leads to failure in French.¹⁰

⁷Dexter and Omwake, p. 271.

⁸With regard to the overall picture, Kwalwasser has said, "The generalization may be made, by and large, that the trained are the talented and the untrained are the untalented." (Exploring the Musical Mind [New York, 1955], p. 40.) This situation he attributes to a process of selection which results in the poorly-equipped student's voluntary abandonment of music study because of his frustration and embarrassment at his poor achievement.

⁹Emily S. Dexter, "Pitch Discrimination and French Accent on the High School Level," Journal of Applied Psychology, XVII (1934), p. 717.

¹⁰Dexter, p. 720.

Perhaps the most intriguing aspect of this second study is the finding that correlation of pitch with accent increases as age of subject decreases.

The conclusions of these two studies are interesting, but certain limitations in their design are apparent. The most serious of these involves the somewhat imprecise ratings for accent. Statistically, a five-degree rating for such subjective judgments is of doubtful validity; it is unlikely that more than three levels of excellence could be distinguished with any accuracy. No data were gathered for males, since subjects for both experiments were drawn from girls' schools.

In 1962, Pimsleur, Stockwell, and Comrey reported two studies of factors involved in learning French.¹¹ Their investigation involved twenty-three tests administered to 208 students in college French, and twenty-two tests administered to 202 additional students one year later. Among those elements considered in Study II but not in Study I was auditory discrimination. The criteria applied to Study II were three: (a) the Cooperative French Test, Advanced Forms Q and R--a standardized test of achievement in reading, grammar, and vocabulary; (b) a lab grade consisting of an estimate of speaking ability given by a laboratory instructor on the basis of the subjects' performance throughout the semester and a final oral test; and (c) a Pictorial Comprehension Test, which was an objectively scored test of listening comprehension. Two of the nineteen variables comprising Study II are factors of musical talent as measured by all standard instruments: pitch discrimination and timbre discrimination. The first of these was measured by two tests, one involving pure tones (Seashore Pitch Measure) and one involving natural language (Chinese Pitch Test). Both pitch tests were found to correlate significantly with criteria a and c, but not with b--a finding at variance with the earlier work of Dexter. Timbre discrimination was also measured by two tests, one involving non-language tones (Seashore Timbre Measure) and the other involving natural language (Phonetic Perception Test). These two variables were found to correlate significantly with criterion c, but not a or b. It is interesting to note, however, that neither Seashore subtest provided information sufficiently

¹¹Paul Pimsleur, Robert P. Stockwell, and Andrew L. Comrey, "Foreign Language Learning Ability," Journal of Educational Psychology, LIII, No. 1, pp. 15-26.

useful to warrant its inclusion among those factors found to contribute .01 or more to the prediction of criteria a or b (grammar-reading and speaking, respectively), although the Chinese Pitch Test was retained for the prediction of criterion a. The Seashore Timbre Measure was, however, retained for prognosis of criterion c (listening comprehension), as was the Chinese Pitch Test; the Seashore Pitch Measure was again discarded as non-significant. Among the conclusions reached by Pimsleur, Stockwell, and Comrey is their judgment "that oral and aural achievement are less subject to satisfactory prediction at the present time [than achievement in a traditional or grammar and reading course], probably due to the lack of adequate criterion tests for achievement in these skills."¹²

Some of the most recent, as well as the most comprehensive work in this area is that reported by Leutenegger, Mueller, and Wershow¹³ in 1965. The investigators made use of all six Seashore subtests (Pitch, Timbre, Rhythm, Time, Tonal Memory, and Intensity) and subjects were drawn from beginning French and Spanish classes at the University of Florida. The orientation of classwork was audio-lingual; the researchers posited that auditory skills would assume significantly greater importance in such an instructional situation than in one where more traditional "grammar-translation" methods obtained. The six Seashore Measures were administered once at the beginning of the semester's work, and again upon completion of the instructional period. Among the six specific aims of the study were the following: (1) "to ascertain whether any of the Seashore scores, plus various intelligence and aptitude factors...can enable the prediction of ease or difficulty of mastering French or Spanish"; (2) "to ascertain whether scores on the Seashore auditory measures improve significantly after completing a semester's study of French or Spanish"; and (3) "to investigate Seashore and other possible factors in French and Spanish course drop-outs."¹⁴ With regard to question 2, it was found that pre- and post-instructional Seashore scores

¹²Pimsleur, Stockwell, and Comrey, p. 26.

¹³Ralph R. Leutenegger, Theodore H. Mueller, and Irving R. Wershow, "Auditory Factors in Foreign Language Acquisition," Modern Language Journal, XLIX (1965), pp. 22-30.

¹⁴Leutenegger, Mueller, and Wershow, p. 23.

presented no significant variation. Among the Seashore scores of those students who did not complete the semester's coursework (question 3), only that of the Rhythm sub-test was found to be significantly lower than scores achieved by course completers. Question 1 is the one most directly related to the present study, and here the investigators found that of the six Seashore sub-tests, only Tonal Memory emerged as "...significant in predicting foreign language acquisition." (Of the fifteen variables considered in all, only one other--Total Reading Scores--was also significant as a predictive factor.) Of interest here, however, is the means by which "foreign language competency" was established.

The French language achievement scores consisted of an average of the number of errors on the daily laboratory tests. These tests followed taped drill periods on given aspects of structure. The student heard several sentences to each of which he had to respond, on machine-scoring blanks, whether or not the structure previously drilled was used in that sentence. For example, the student had to react to such questions as: (a) "Was the final consonant present which indicated the plural of the verb?," (b) "Was the pronoun used or omitted?," and (c) "Was the noun in the masculine or feminine gender?--base your judgment on the prefix [sic] used."¹⁵

The testing technique thus described is both ingenious and objective, but the intellectualized and indirect nature of such an instrument might conceivably serve to obscure the very relationships between musical acuties and language achievement which are being investigated.

The present study differs from the preceding in several respects. The language employed is Spanish, where previous investigations have concerned themselves primarily with French; and subjects' average age was approximately ten years. This age group was singled out as most appropriate since the investigators wished to test the youngest subjects possible, and experience indicated that below the age of ten, mass testing in a language laboratory was probably not feasible.

¹⁵Leutenegger, Mueller, and Wershow, p. 24.

METHODS

The pilot study preceding the principal investigation was conducted with 28 students in the fifth and sixth grades at Florida State University Demonstration School, and was designed to establish sample sizes and testing procedures, as well as to instruct the linguistics raters who would judge the oral performance of subjects involved in the final study. The procedure followed in the pilot was fundamentally the same as that described below for the final study, with the important exception that data obtained in the pilot were cross-sectional, while those from the later study were longitudinal. There was some subject overlap in the pilot, but the group taking the Seashore and the group taking the language test were essentially made up of different children. Comprehension was tested in the final investigation, but was omitted from the pilot since projected testing for this skill was completely objective and seemed unlikely to pose any material difficulties.

From the data obtained in the pilot, it was determined that 75 subjects would constitute an adequate sampling for the final study. All participants in the investigation were recruited from the fifth grade public school population of Leon County, Florida, and in fulfillment of an a priori condition established for the study, no data were included for any subject with significant previous exposure to Spanish. Of those 80 subjects who successfully completed all project work, only one--a girl born in Cuba, who had lived there for the first four years of her life and spoken Spanish before English--was eliminated from consideration.¹⁶ The 79 subjects for whom data were retained in the final study comprised 39 females and 40 males, I.Q.'s ranging from 71 to 137 with a mean of 103.6¹⁷; and in a further attempt to exclude interference from extraneous factors, it was arranged that all subjects be instructed in

¹⁶It is interesting to note, however, that this child's overall performance on the Spanish testing instrument did not differ significantly from that of her peers (as judged by I.Q. and Seashore scores).

¹⁷All I.Q. scores were obtained by means of the California Short Form Test of Mental Maturity, Level II, 1963 S-Form (Del Monte Research Park, Monterey, California: California Test Bureau). This instrument was administered

Spanish by the same teacher, this in order to minimize any variation in performance that might result from differences in accent, presentation of materials, and teaching effectiveness.

At the beginning of the final study, five¹⁸ of the six Seashore Measures--Pitch, Intensity, Rhythm, Timbre, and Tonal Memory--were administered to all participating subjects. A six-week period of audio-lingual instruction (thirty minutes per child per school day, for a total of fifteen hours per subject) in Spanish followed; at no time was there any exposure to written Spanish. In keeping with the age and relatively limited attention span of the subjects, a teaching approach built around games, songs, rhymes, and the folktale of "The Three Bears" was pursued in all classwork. The level of interest evidenced by subjects throughout the language instructional period was gratifyingly high, and for this reason, it seems unlikely that motivational factors contributed to any significant variation in subjects' final performance.¹⁹

The entirely oral-aural Spanish language test undergone by all subjects at the termination of the instructional period was administered in the language laboratory facilities of Florida State University. Both active speech production and the passive skill of comprehension were measured. The test for comprehension was based upon a multiple-choice situation. Subjects heard a series of ten questions with three answer choices for each (see Appendix A). After hearing through each question and the three answers offered,

routinely to all fifth grade pupils in the public schools of Leon County during a period which coincided with the language instruction phase of the present study.

¹⁸Time was omitted for two reasons. Of all the Measures, it is generally considered to be the least useful; in addition, it seemed unlikely to be related directly to any of the areas of accent considered in the present work.

¹⁹There is at present no FLES program in any school in Leon County. This fact seemed to heighten student-subjects' enthusiasm for the Spanish instruction associated with the study, since the youngsters involved felt that they formed a sort of "elite," singled out for a special privilege not available to several thousand of their peers in other schools of the area.

subjects wrote on a pre-numbered answer sheet the letter (a, b, or c) identifying their choice. All questions and answer choices were based upon material that had been drilled extensively in class. Typical of the items comprising the comprehension measure is the following:

1. ¿De qué color es el vestido?

a. Hay dos.

b. Son cuatro.

c. El vestido es azul.

Testing of active language production was more extensive than that for comprehension and was divided into two sub-sections, I and II. Both sub-sections were designed to elicit specific information concerning phone production, intonation, stress, and sinalepha, but while sub-section I measured these four factors within a context approximating normal conversation, sub-section II assessed the same four variables in the relative isolation of single words or brief phrases (see Appendices B and C). The two sub-sections further differed in that for sub-section I, subjects were required to answer a series of questions and commands with previously memorized responses (prompted by pictorial cue cards--see Appendix D--distributed to subjects before testing began), while sub-section II relied solely upon mimicry of the material presented aurally with no visual cues. The following item illustrates the contextual responses required by sub-section I, as well as the way in which particular speech components were designated for rating.

Aural Cue: ¿Qué es esto?

Visual Cue: picture of house in forest

Subject Response:

10

Esta es la casa de los tres osos.

1 2 3 4 5 6 7 8 9 11

Rating Key: 1. [e]; 2. (sinalepha); 3. [a];

4. [k] (unaspirated); 5. [a]; 6. [d̃]; 7. [s];
 8. [tr]- initial cluster + [e]; 9. [o]; 10. highest
 pitch level of utterance; 11. sentence-terminal
 falling pitch on osos.

The next examples are typical of "isolation" items comprising sub-section II. The material used in this portion of the test was, in contrast to that of sub-section I, unfamiliar to the subjects; having heard each item through, subjects were instructed to repeat what they had heard as accurately as they were able.

Intonation: 1 2 3 1
 No hay nadie? /1231 /
 Stress: esta ˈ
 está ˈ
 Sinalepha: Está aquí.
 1
 ¿Qué es esto?
 2
 Phones: luna 1. [u]
 1
 tina 2. [t] (unaspirated and dental)
 2

The tape recorded responses of the subjects secured in this language test were duplicated and submitted to three independent linguistic raters, each of whom judged the 155 specified language features on a right-wrong scale.

FINDINGS AND ANALYSIS

For each of the 40 boys and 39 girls in the study scores were obtained for the following 15 variables: I.Q. measured by the California Short Form Test of Mental Maturity, Level II; pitch, intensity, rhythm, timbre and tonal memory measured by the Seashore Measures of Musical Talent administered by the investigators; Spanish comprehension

measured by an oral-aural multiple choice test administered by the investigators; intonation, stress, sinalepha and phones in context and intonation, stress, sinalepha and phone production in isolation measured by an oral-aural Spanish test administered by the investigators.

The comprehension test score was determined by the total number correct of 10 possible on an objective multiple-choice test. The scores for intonation, stress, sinalepha and phones in context and in isolation were determined by the total number correct on the relevant parts of the oral-aural test as judged by the raters; when the three raters were not unanimous in their judgment, the majority opinion determined whether an item was correct or incorrect. The total possible scores and the means and standard deviations of the scores attained are given for the Seashore and Spanish tests in Table 1. Also included in Table 1 are composite scores for the four language variables in context, for the four language variables in isolation and for the composite of these eight language scores. Note the relatively high mean and low standard deviation for the composite scores in context compared with the composite scores in isolation.

The means and standard deviations for the 15 basic variables are given for boys and girls in Table 2. The differences between the mean scores for boys and girls was not significant for any of these variables and the sex variable is thus ignored in all subsequent analyses.

Zero-order correlations. The zero-order intercorrelation matrix was computed for the five Seashore variables and the nine Spanish variables and is given in Table 3. Note that the only negative correlation in this matrix is for pitch and sinalepha, and that correlation is close to zero. For ease of interpretation, Table 3 is partitioned as shown on page 21.

Several of the Seashore variables are significantly correlated with each other; in particular, timbre is strongly correlated with intensity and rhythm (.01 level) and tonal memory is strongly correlated with pitch, intensity and rhythm (.01 level).

There are a number of significant correlations between Seashore variables and Spanish variables. In particular, considering the Spanish scores in context, the correlations significant at the .01 level are intensity with phones, timbre with phones and timbre with intonation. Considering the Spanish scores of items in isolation, the correlations significant at the .01 level are pitch with stress,

TABLE 1.--Maximum Attainable Scores, Mean Scores and Standard Deviations for Seashore and Spanish Variables

<u>Variable</u>	<u>Maximum</u> <u>Attainable</u>	<u>Mean</u>	<u>Standard</u> <u>Deviation</u>
<u>Seashore</u>			
pitch		30.43	7.80
intensity		35.87	8.34
rhythm		21.99	3.73
timbre		33.10	6.07
tonal memory		14.94	7.08
<u>Spanish in Context</u>			
intonation	15	9.29	3.43
stress	5	3.78	1.14
sinalepha	10	4.99	2.11
phones	50	21.67	9.38
<u>Spanish in Isolation</u>			
intonation	15	12.10	2.31
stress	20	18.41	1.58
sinalepha	20	12.65	3.06
phones	20	11.48	2.57
Composite in Context	80	39.73	14.73
Composite in Isolation	75	54.63	7.65
Composite Total	155	94.37	18.86

TABLE 2.--Means and Standard Deviations for I.Q., Seashore
and Spanish Variables for Boys and Girls

<u>Variable</u>	<u>Boys</u>	<u>Girls</u>
I.Q.	98.47 (21.62)	106.21 (17.36)
<u>Seashore</u>		
pitch	28.95 (8.62)	31.95 (6.62)
intensity	36.25 (8.82)	35.51 (7.92)
rhythm	22.37 (3.23)	21.95 (4.19)
timbre	31.37 (5.85)	34.87 (5.85)
tonal memory	14.55 (7.45)	15.33 (6.74)
Spanish Comprehension	6.25 (1.88)	6.87 (6.56)
Spanish in Context		
intonation	8.45 (3.16)	10.15 (3.51)
stress	3.60 (1.06)	3.97 (1.20)
sinalepha	4.47 (1.81)	5.51 (2.28)
phones	19.37 (7.43)	24.03 (10.62)
Spanish in Isolation		
intonation	12.27 (2.29)	11.92 (2.36)
stress	18.50 (1.40)	18.31 (1.76)
sinalepha	12.70 (3.14)	12.59 (3.02)
phones	11.32 (2.42)	11.64 (2.73)

TABLE 3.--Correlation Matrix for I.Q., Seashore and Spanish Variables

I.Q.	Seashore				Compre- hension	Spanish in Context		Spanish in Isolation	
	Pitch	Intensity	Rhythm	Timbre		Intonation Stress	Sinalapha Phones	Intonation Stress	Sinalapha Phones
I.Q. 1.0000	.1925	.3243**	.3398**	.4021**	.1888	.3204**	.2482*	.2702*	.3599**
Pitch 1.0000		.2617*	.1843	.2184	.2027	.1924	.1736	.1078	.3011**
Intensity 1.0000			.2025	.3098**	.2466*	.2859*	.2400*	.3395**	.2918*
Rhythm 1.0000				.3066**	.2392*	.2348*	.2615*	.2734*	.3115**
Timbre 1.0000					.0999	.3541**	.2329*	.2695*	.3142**
Tonal memory 1.0000					.1078	.2112	.1414	.2315*	.2693*
Comprehension						.3948**	.3060**	.2813*	.2484*
Intonation						1.0000	.7283**	.2146	.2429*
Stress						1.0000	.6015**	.1883	.1912
Sinalapha						1.0000	.7441**	.2815*	.2751*
Phones						1.0000		.3294**	.3750**
Intonation						1.0000	.4864**	.5371**	.4194**
Stress						1.0000		.4958**	.4790**
Sinalapha						1.0000		1.0000	.6269**
Phones						1.0000			1.0000

pitch with sinalepha, pitch with phones, intensity with intonation, rhythm with stress, rhythm with sinalepha, timbre with stress, timbre with sinelepha and timbre with phones.

I.Q.			
Seashore with Seashore	Comprehension	Seashore with Spanish in Context	Seashore with Spanish in Isolation
		Comprehension	
		Spanish in Context with Spanish in Context	Spanish in Context with Spanish in Isolation
		Spanish in Isolation with Spanish in Isolation	

All six of the intercorrelations between Spanish variables in context are significant at the .01 level, as are all six of the corresponding intercorrelations between Spanish variables in isolation. However, the only correlations between Spanish variables in context and Spanish variables in isolation significant at the .01 level are phones in context with intonation in isolation and phones in context with sinalepha in isolation. At the .01 level, comprehension is correlated with each of the four Spanish variables in context and with none of the four Spanish variables in isolation.

I.Q., Spanish comprehension and Seashore variables were also correlated with the composite Spanish variable in context, the composite Spanish variable in isolation and the total composite Spanish variable; these correlations are given in Table 4. The only correlations not significant at the .01 level are pitch with context composite, pitch with total composite and tonal memory with context composite. The intercorrelations for the three composite Spanish scores are also given in Table 4. Note particularly the

TABLE 4.--Correlations between Composite Spanish Scores and I.Q., Seashore and Spanish Comprehension Variables

	<u>Composite in Context</u>	<u>Composite in Isolation</u>	<u>Composite Total</u>
I.Q.	.453**	.405**	.339**
pitch	.251*	.146	.338**
intensity	.393**	.325**	.343**
rhythm	.379**	.305**	.348**
timbre	.486**	.413**	.405**
tonal memory	.339**	.267*	.321**
Spanish comprehension	.461**	.465**	.241*
Composite in context		.925**	.684**
Composite in isolation			.357**
Composite total			

very high correlation between context composite and total composite scores.

Partial Correlations. A matrix of intercorrelations was computed for the Seashore and Spanish variables partialled with respect to I.Q.; this matrix is given in Table 5. It is partitioned in the same way as Table 3, except for the omission of the first row, I.Q.

In general, the correlations of the Seashore variables with each other are lowered considerably by taking account of I.Q.; the exception to this is the partial correlation between pitch and tonal memory which is not much lower than the corresponding zero-order correlation.

The correlations between Seashore variables and Spanish variables also generally are lowered by partialling with respect to I.Q. Considering the Spanish scores in context, the only partial correlation significant at the .01 level is timbre with phones. Considering the Spanish scores in isolation, the partial correlations significant at the .01 level are pitch with stress and timbre with phones. A summary of the effects of partialling with respect to I.Q. is given in Table 6. Correlations listed there are highly statistically significant (.01 level) before partialling; their significance after partialling is indicated by one asterisk (.05 level) or two asterisks (.01 level).

All six of the partial intercorrelations between Spanish variables in context are significant at the .01 level, as are all six of the corresponding intercorrelations between Spanish variables in isolation. In general, these partial correlations are not much lower than the corresponding zero-order correlations. None of the correlations between Spanish variables in context and Spanish variables in isolation is statistically significant. At the .01 level, comprehension is partially correlated with each of the four Spanish variables in context except stress and with none of the four Spanish variables in isolation.

Canonical Analysis. A canonical analysis (see Table 7) was performed for the five Seashore variables (pitch, intensity, rhythm, timbre and tonal memory) and the nine Spanish variables (comprehension; intonation, stress, sinalepha and phones in context; and intonation, stress, sinalepha and phones in isolation). The maximum canonical correlation is .663, which is considerably higher than the zero-order intercorrelations and is statistically significant at well beyond the .01 level (Chi square is 188.82 with 45 degrees of freedom).

TABLE 5. Correlation Matrix for Seashore and Spanish Variables Partialled with Respect to I.Q.

Seashore					Spanish in Context				Spanish in Isolation				
Pitch	Intensity	Rhythm	Timbre	Total Memory	Comprehension	Intonation	Stress	Sinalepha	Phones	Intonation	Stress	Sinalepha	Phones
Pitch	1.0000	.2147	.1288	.1570	.4992**	.1407	.1323	-.0615	.0642	.0590	.3408	.2532*	.2977*
Intensity	1.0000	.1037	.2071	.2595*	.1995	.2030	.1741	.2254	.2023	.2765*	.2275	.1984	.1390
		Rhythm	1.0000	.1974	.1896	.1413	.1944	.2122	.1787	.2005	.2740*	.2664*	.1040
		Timbre	1.0000	.2534*	.0267	.2596*	.1501	.1643	.3161**	.1825	.2795*	.1984	.3353**
		Total memory		1.0000	.0358	.0956	.0474	.0394	.1473	.1399	.1523	.1465	.2312*
Comprehension					1.0000	.3594**	.2724*	.3449**	.4317**	.2436*	.0735	.1970	.0642
Intonation					1.0000	1.0000	.7071**	.6778**	.7542**	.1403	.2022	.0521	-.0356
						Stress	1.0000	.5756**	.5611**	.1300	.1564	.0473	.0508
							Sinalepha	1.0000	.7300**	.2306*	.1836	.2066	.1112
								Phones	1.0000	.2449*	.2207	.2607*	.2086
									Intonation	1.0000	.4645**	.4897**	.3805**
									Stress	1.0000	1.0000	.4730**	.4586**
											Sinalepha	1.0000	.5983**
												Phones	1.0000

TABLE 6.--Result on Zero-Order Correlations Significant at the .01 Level of Partialling with Respect to I.Q.

Spanish-Music Correlations

In Context	
intonation with timbre*	
phones with loudness	
with timbre**	
In Isolation	
stress with pitch**	
with rhythm*	
with timbre*	
sinalepha with pitch*	
with rhythm*	
with timbre	
phones with pitch*	
with timbre**	
with tonal memory*	

TABLE 7.--Coefficients for Canonical Relationship between
Standardized Seashore and Spanish Variables

<u>Variable</u>	<u>Coefficient in Canonical Relation- ship</u>
<u>Seashore</u>	
pitch	.596
intensity	.205
rhythm	.276
timbre	.500
tonal memory	-.128
Spanish Comprehension	.163
Spanish in Context	
intonation	.492
stress	.127
sinalepha	-.394
phones	.105
Spanish in Isolation	
intonation	-.104
stress	.388
sinalepha	.281
phones	.335

Discriminant Analysis. On the basis of the distribution of composite total Spanish score, the 79 students were categorized into high ($n = 16$), medium ($n = 47$) and low ($n = 16$) Spanish accent achievement groups. The composite Spanish scores for the high group range from 110 to 135 with a mean of 120.50; the Spanish scores for the medium group range from 80 to 107 with a mean of 94.51; the scores for the low group range from 50 to 78 with a mean of 67.81. The average I.Q. scores for the students in the three groups are, respectively, 111.50 with a range of 77 to 137; 103.34 with a range of 76 to 136 and 90.00 with a range of 71 to 119.

The means and standard deviations of the Seashore scores are given for the three Spanish accent achievement groups in Table 8. Without exception, the mean scores on the Seashore variables decrease as the Spanish group goes from high to medium to low, although none of the differences between successive groups is statistically significant. Correlations between Seashore variables and total composite language score are given for the three Spanish groups in Table 9. Note that the only negative correlation in this table is between rhythm and total Spanish score for the high Spanish achievement group. In general, considering the relatively small sample sizes, the differences among the correlations for the three groups are not large.

A discriminant analysis was performed; the discriminant function, based on the Seashore variables, did not provide statistically significant predictions of Spanish achievement group.

DISCUSSION AND CONCLUSIONS

The results of this study indicate a rather strong relationship between discriminatory musical abilities in pitch, intensity, rhythm, timbre, and tonal memory and achievement of Spanish accent. With one exception, all 40 of the correlations between musical abilities and Spanish accent achievement are positive and many of them are statistically significant. Because all of the musical ability measures except pitch are highly significantly correlated with I.Q., the partial correlations with respect to I.Q. between musical ability and Spanish accent achievement are of more interest than the zero-order correlations.

Considering these partial correlations, timbre and phones both in context and in isolation are strongly related

TABLE 8.--Means and Standard Deviations for Seashore
Variables for High, Medium and Low Spanish
Groups

<u>Variable</u>	<u>High</u>	<u>Medium</u>	<u>Low</u>
pitch	32.63 (8.29)	30.64 (7.56)	27.63 (7.63)
intensity	39.13 (7.17)	36.47 (7.64)	30.94 (9.66)
rhythm	23.94 (2.84)	22.02 (3.49)	19.94 (4.31)
timbre	37.56 (6.22)	32.66 (4.90)	29.94 (6.85)
tonal			
memory	18.69 (8.72)	14.51 (6.43)	12.44 (5.93)

TABLE 9.--Correlations Between Composite Total Spanish Scores and Seashore Variables for High, Medium and Low Spanish Groups

<u>Variable</u>	<u>High</u>	<u>Medium</u>	<u>Low</u>	<u>Total</u>
pitch	.162	.140	.183	.251
intensity	.340	.139	.485	.393
rhythm	-.200	.281	.165	.379
timbre	.393	.234	.408	.486
tonal				
memory	.246	.188	.192	.339

(.01 level), as are pitch and stress in isolation. There are a number of other statistically significant though less strong relationships (.05 level): pitch with sinalepha and phones in isolation; intensity with intonation in isolation; rhythm with stress and sinalepha in isolation; timbre with intonation in context; and stress in context and tonal memory with phones in isolation.

It should be noted that the correlations between I.Q. and Spanish accent achievement measured in context are larger, in general, than these correlations when Spanish accent achievement is measured in isolation; thus the effect of partialling with respect to I.Q. is greater, in general, for correlations involving Spanish accent in context than in isolation. This is consistent with the greater importance of memory in the context material.

Spanish comprehension score is not strongly related to I.Q., musical abilities or Spanish accent measured in isolation, but is strongly related to Spanish accent measured in context. This seems to indicate that there is an ability to comprehend and speak Spanish (in context) that is largely independent of I.Q. This is confirmed by the fact that the Spanish accent measures in context are highly intercorrelated in all six cases, even after partialling with respect to I.Q., as are the Spanish accent measures in isolation; correlations between the same aspect of Spanish accent measured in context and in isolation are much lower, and none is significant at even the .05 level after partialling with respect to I.Q.

The Seashore musical abilities measures are supposedly constructed to be relatively independent of each other and the data confirm that this is the case, with the possible exception of tonal memory which is strongly related to pitch (.01 level) and less strongly related (.05 level) to intensity and timbre even after partialling with respect to I.Q.

The overall relationship between the musical abilities variables and the Spanish accent achievement variables is highly significant as indicated by the canonical analysis. The variables contributing most strongly to this relationship are the musical abilities variables pitch and timbre and the Spanish accent achievement variables intonation and sinalepha in context and stress and phones in isolation. This overall relationship is consistent with the zero-order and partial correlations and provides an interesting composite analysis of these relationships. The musical abilities variables did not provide a significant discriminant

function for predicting three groups partitioned on the basis of total Spanish accent achievement score. This corresponds to the fact that total Spanish accent achievement score is in fact continuous and that the measures of it in this study range widely within each of the groups. The consistent variation of the means for the musical abilities variables with respect to Spanish achievement group is apparently a reflection of a basically continuous relationship as are the relatively constant correlations between the musical abilities scores and total Spanish achievement scores compared across Spanish achievement groups.

Thus, in summary, the results of this study indicate that musical ability and Spanish accent achievement are strongly related, even when their common relationship with I.Q. is taken into consideration. Further analysis of the results indicates that this is a continuous type of relationship; there is no indication that musical ability can predict Spanish accent achievement more accurately at one end of the continuum than at the other. Further research is necessary to determine the generality of these results with respect to other languages.

RECOMMENDATIONS

While it is obviously not possible to extrapolate the results of experimentation with a single language to languages in general, the rather close relationship found to exist between certain musical acuities and Spanish learning in young subjects suggests the possibility that music and second-language learning may, during early childhood and over a protracted time period, be mutually reinforcing. The fact that the sex variable proved uninteresting in the present study, while researchers working with older subjects have found seemingly sex-linked differences,²⁰ implies that such differences may be the product of cultural conditioning and/or biased sampling rather than innate inequalities.

With regard to older students--adolescents and young adults of college age--it would seem that the study of music and languages might well be regarded as complementary fields of endeavor. It has been the authors' observation that guidance counselors working with these age groups often stress to the person manifesting interest in both areas (a

²⁰See, for example, Leutenegger, Mueller, and Wershow, op. cit., pp. 23 ff.

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APPENDIX A

Listening Comprehension Test and Tape Recorded Instructions

Taped Instructions

You are now going to hear a group of ten questions. After each question, you will hear three possible answers identified by the letters a, b, and c. Only one of the answers is correct. After you have listened to the question and all three possible answers, write only the letter of the correct answer beside the number of that question. For example, if you thought "answer b" was the correct answer to question number 8, then you would write the letter b beside the number 8 on your paper. First, we are going to let you hear 2 sample questions. Do not write down your answers to these questions, but simply listen very carefully and decide for yourself which is the correct answer for each question. These two examples are to show you what the other ten questions are like. Here is example number 0.

¿Qué día es hoy?

- a. Tengo hambre.
- b. La corbata es azul.
- c. Hoy es martes.

The right answer to this question was "letter c." Now you will hear example 00. Again, listen, but do not write anything.

¿De qué color es el oso grande?

- a. Es café.
- b. Es verde.
- c. Veo cinco.

"Answer a" was the right one for this question.

Now we are ready to begin. Remember, write only the letter of the correct answer beside the number of each question.

Listening Comprehension Test

Number 1. ¿De qué color es el vestido?

- a. Hay dos.
- b. Son cuatro.
- c. El vestido es azul.

Number 2. ¿Cuántos años tienes?

- a. No, no es mío.
- b. Tengo diez años.
- c. Es azul.

Number 3. ¿Te gusta el chocolate?

- a. Son muchos.
- b. Dámelo.
- c. Sí, me gusta.

Number 4. ¿Cómo se llama el niño?

- a. El niño se llama Miguel.
- b. Lleva zapatos negros.
- c. El niño quiere manzanas.

Number 5. ¿Cuántos dedos vas?

- a. No tiene nada.
- b. Es amarillo.
- c. Veo siete.

Number 6. ¿Qué día es mañana?

- a. Mañana es miércoles.
- b. Es una niña buena.
- c. Es morada.

Number 7. ¿Qué tiempo hace?

- a. No me gustan las nías.
- b. No veo ninguno.
- c. Está nublado y hace frío.

Number 8. ¿Cómo está la temperatura hoy?

- a. Hay ocho.
- b. Hace frío.
- c. No está.

Number 9. ¿Dónde está la casa de los osos?

- a. Está en el bosque.
- b. Es negra.
- c. Ayer fue lunes.

Number 10. ¿Es bonita la flor?

- a. No gusta la manzana.
- b. El oso no está.
- c. Sí, es bonita.

APPENDIX B

Spanish Achievement Test Directions*

Spanish Achievement Test, Part One. You are now going to hear eleven sentences in Spanish, one after the other. All of them except for sentence number ten are questions. In number ten, you will be told to ask me a question. Along with each sentence, there is a picture on your card that will help you answer. The number on the picture matches the number of the question. Listen carefully to each sentence, look at the picture that matches it, and then answer as you have been taught to answer in Spanish, speaking clearly into your microphone. Do not exaggerate your answer in any way, but speak naturally, as you do in class. Now, before we begin, let's practice with two examples. Here is example number zero. Listen, then record your answer. "¿Cómo te llamas?" (pause) Fine. Now here is example number zero-zero. Listen and record your answer to this one. "¿Cuántos años tienes?" (pause) Good. Now we are going to begin. Listen carefully and answer after you have heard each question through.

*The children were tested on two successive days in groups of 40 and 39 respectively. All 79 could have been accommodated in the laboratory in a single session, but the group was split in order that more control might be exercised over subjects during the testing procedure. These directions were heard by each child through the headset at his booth. Each booth had been set up in advance of the children's arrival in the language laboratory (tapes threaded, volume adjusted, visual cue cards distributed, etc.) and two laboratory assistants monitored the children during the actual testing period to see that they addressed the microphone properly and did not tamper with the equipment. Similar directions accompanied the listening comprehension test, which was administered immediately following the test for production. In the comprehension test, the children heard each question, read once, followed by three answer choices, also read once. Answer choices (A, B, or C) were not recorded, but written on prenumbered sheets distributed to each child at his booth.

* * *

This is all of Part One. Now we are going to begin Part Two, which is divided into four sections: A, B, C, and D. The directions for each of these four sections are simple. Listen very carefully to each item, and then repeat as accurately as you can what you have just heard. Now we are going to begin Section A. There are fifteen short sentences in this section. Listen carefully to each one, then repeat it.

* * *

This is the end of Section A. Now we are ready to begin Section B. You will hear twenty different words, one after the other. Listen carefully to each one, then pronounce it as accurately as you can.

* * *

This is the end of Section B. Now we will begin Section C. You will hear twelve short sentences. Again, listen very carefully to each one and then repeat it as accurately as you can.

* * *

This is the end of Section C. We are now ready to begin Section D, the last section of Part Two. You will hear seventeen words, one after the other. Listen to each word, then repeat it as accurately as you can.

* * *

This is the end of the Spanish Pronunciation Test. Turn off your main power switch now and listen for further instructions from your teacher.

APPENDIX C

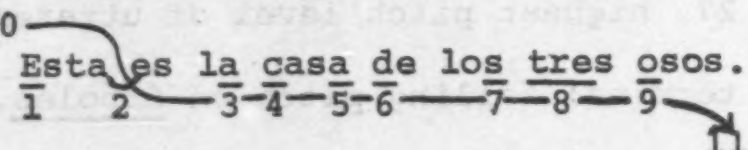
ORAL SPANISH ACHIEVEMENT TEST: RATER WORKSHEETS

Part I: Production

Subj. No. _____

A. Aural Cue #1: ¿Qué es esto?

Visual Cue: Picture of house in forest.

Response: ¹⁰Esta ¹es ²la ³casa ⁴de ⁵los ⁶tres ⁷osos ⁸. ⁹


Rater key: 1. [e]; 2. ∪ (sinalepha); 3. [a];

4. [k] (unaspirated); 5. [a]; 6. [d]; 7. [s]

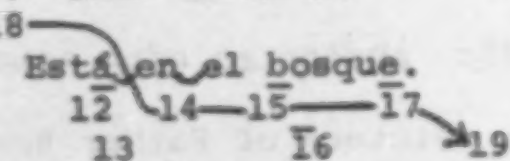
8. [tr] - initial cluster + [e]; 9. [o]; 10. high-

est pitch level of utterance; 11. sentence -

terminal falling pitch on osos.

B. Aural Cue #2: ¿Dónde está la casa?

Visual Cue: Same as in A.

Response: ¹⁸Está ¹²en ¹³el ¹⁴bosque. ¹⁵


Rater key: 12. // (stress); 13. ∪ (sinalepha);

14. ∪ (sinalepha); 15. [b] (unaspirated); 16. [o];

17. [e]; 18. highest pitch level of sentence;

19. sentence-terminal falling pitch on bosque.

C. Aural Cue #3: ¿Hay muchos árboles en el bosque?

Visual Cue: Same as in A & B.

Response: ²⁷ Sí, hay muchos árboles.
 20-21-22-23-26
 24 25 → 28

Rater key: 20. [ay]; 21. [u]; 22. [s]; 23. [ar]-
 initial cluster; 24. /' / (stress); 25. [o]; 26. [e];
 27. highest pitch level of utterance; 28. sentence -
 terminal falling pitch on árboles.

D. Aural Cue #4: ¿Dónde está la flor?

Visual Cue: Picture of flower.

Response: Aquí está la flor.
 29 31-32
 30 → 33

Rater key: 29. /' / (stress); 30. ∪ (sinalepha);
 31. [a]; 32. [r] final; 33. falling intonation as
 shown.

E. Aural Cue #5: ¿Quién es este animal?

Visual Cue: Picture of Father Bear.

Response: ⁴² Es el oso grande.
 34 36-38-39-41
 35 37 40 → 43

Rater key: 34. [e]; 35. ∪ (sinalepha); 36. [l]
 (high, convex position); 37. ∪ (sinalepha); 38. [o];
 39. [gr] - initial cluster; 40. [a]; 41. [e]; 42.
 highest pitch level of sentence, dropping markedly

on el; 43. falling intonation on grande, absence of English /3 1/.

F. Aural Cue #6: Aquí está el oso pequeño. ¿Te gusta?

Visual Cue: Picture of Baby Bear with ball.

Response: Sí, me gusta.

44-45 → 46

Rater key: 44. [e]; 45. [g]; 46. falling final intonation, absence of English /3 1/ on gusta.

G. Aural Cue #7: ¿Va a jugar?

Visual Cue: Same as in F.

Response: Sí, va a jugar.

47-49-50 → 52
48 51

Rater key: 47. [β]; 48. ∪ (sinalepha); 49. [H]; 50. [ar] (final); 51. /' / on final syllable; 52. falling Spanish intonation (/2 1 1/), absence of English /2 3 1/.

H. Aural Cue #8: ¿Qué tiene el oso pequeño?

Visual Cue: Picture of Baby Bear with ball.

Response: Tiene una pelota.

53-54-56-58-59 → 62
55 57 60 61

Rater key: 53. [ie]; 54. [e]; 55. ∪ (sinalepha);

56. [u]; 57. [a]; 58. [p] (unaspirated); 59. [l]
 (high convex position); 60. [o]; 61. [t] (dental,
 unaspirated); 62. falling declarative intonation, as
 marked.

I. Aural Cue #9: Dile "adiós" al osito.

Visual Cue: Same as in #8.

Response: adiós, osito.
 63 65 66 → 67
 64

Rater key: 63. two syllables only, as opposed to
 anglicization into three; 64. [d]; 65. /' / (stress);
 66. [o]; 67. drop in intonation after adiós, pitch
 held level on osito.

J. Aural Cue #10: Aquí está el oso mediano. ¿De qué
 color es el vestido?

Visual Cue: Mother Bear wearing blue dress.

Response: El vestido es azul.
 68 69 70 71 — 72 — 73 → 74

Rater key: 68. [l] (high, convex tongue position);
 69. [b]; 70. [d]; 71. ∪ (sinalepha); 72. [u]; 73.
 [l] (high, convex tongue); 74. falling intonation on
azul, absence of English /3 1/.

K. Aural Cue #11: Pregúntame si hace frío.

Visual Cue: Stick figure of trembling man.

Response: Señora, ¿hace frío? ⁸⁰
 75 77 78 79
 76

Rater key: 75. [e]; 76. [ñ]; 77. [o]; 78. [e];

79. [fr] - initial cluster; 80. inflection as marked, with drop after second syllable of señora and rising sentence terminal, but not to highest (/4/) level of English (relative to rest of sentence).

End of Part I of Production

Part II: Production

A. Intonation

- | | | |
|---------------------------------|--------------|---------------------|
| 1. Está aquí.† | 1 2 1 | /1211+/- |
| 2. ¿No hay nadie?† | 1 2 3 1 | /1231+/- |
| 3. ¿No hay muchos?† | 2 2 2 | /(1)222+/- |
| 4. Buenos días,† señor Mortiz.† | 2 31 1 1 1 1 | /1231+/- # /1111+/- |
| 5. Sí,† señora.† | 21 1 1 1 | /(1)2(1)1+/- # |
| 6. ¿No quieres ir?† | 1 2 2 31 | /111(1)+/- |
| 7. Adiós.† | 1 2 1 | /1231+/- |
| 8. No soy de México.† | 2 2 2 2 1 1 | /121(1)+/- |
| 9. Ven acá.† | 2 2 2 | /2221+/- |
| 10. ¿Te quieres más?† | 1 2 2 31 | /(1)222+/- |
| | | /1231+/- |

- | | | | |
|-----|-----------|---------------------------|----------------------------|
| 11. | 2 2 2 3 | ¿Cuántos años tienes tú?† | /2223†/ |
| 12. | 2 2 1 | No lo veo.† | /(2) 221†/ |
| 13. | 2 1 | ¿Dónde estás?† | /(2) (2) 21†/ |
| 14. | 2 1 | ¿Cuál es?† | /(2) (2) 21†/ |
| 15. | 2 2 1 2 2 | Es éste, ¿verdad?† | /(2) 221†/ #
/(1) 222†/ |

B. Stress

- | | | |
|-----|--------------|---------|
| 1. | esta | ˘ ˘ |
| 2. | está | ˘ ˘ |
| 3. | llego | ˘ ˘ |
| 4. | llegó | ˘ ˘ |
| 5. | constitución | ˘ ˘ ˘ ˘ |
| 6. | teléfono | ˘ ˘ ˘ ˘ |
| 7. | automóvil | ˘ ˘ ˘ ˘ |
| 8. | aéreo | ˘ ˘ ˘ ˘ |
| 9. | telegrama | ˘ ˘ ˘ ˘ |
| 10. | señor | ˘ ˘ |
| 11. | será | ˘ ˘ |
| 12. | cera | ˘ ˘ |
| 13. | cantó | ˘ ˘ |
| 14. | canto | ˘ ˘ |
| 15. | andaré | ˘ ˘ ˘ |
| 16. | escribir | ˘ ˘ ˘ |

17. institución

18. carnaval

19. si no . . .

20. sino

C. Sinalepha

1. Está aquí.

1

2. ¿Qué es esto?

2

3. El hombre no anda.

3

4

4. ¿Va a hacerlo?

5

6

5. No hombre, no está.

7

8

6. Es un amo bueno.

9

10

7. Es mi abuelo.

11

8. Es mi hija.

12

9. Ese animal es peloso.

13

14 15

10. ¿Cuáles son?

16

11. Ahí está el avión.

17

18 19

12. Tiene dos alas.

20

D. Phone Production

- | | |
|------------------|--|
| 1. andar
1 | 1. [ar] (final) |
| 2. señor
2 3 | 2. [e]; 3. [or] (final) |
| 3. quiere
4 | 4. [ie] |
| 4. luna
5 | 5. [u] |
| 5. bueno
6 | 6. [ue] |
| 6. con Paco
7 | 7. [m] |
| 7. cada
8 9 | 8. [d]; 9. [a] |
| 8. pipa
10 11 | 10. [p] (unaspirated); 11. [i] |
| 9. sisal
12 | 12. [a] (high, convex tongue shape on [i]) |
| 10. aliado
13 | 13. [ly] |
| 11. cata
14 | 14. [t] (unaspirated and dental) |
| 12. rosa
15 | 15. [s] |
| 13. tina
16 | 16. [t] (unaspirated and dental) |
| 14. kilo
17 | 17. [k] (unaspirated) |

15. buey
18

18. [uey]

16. pudo
19

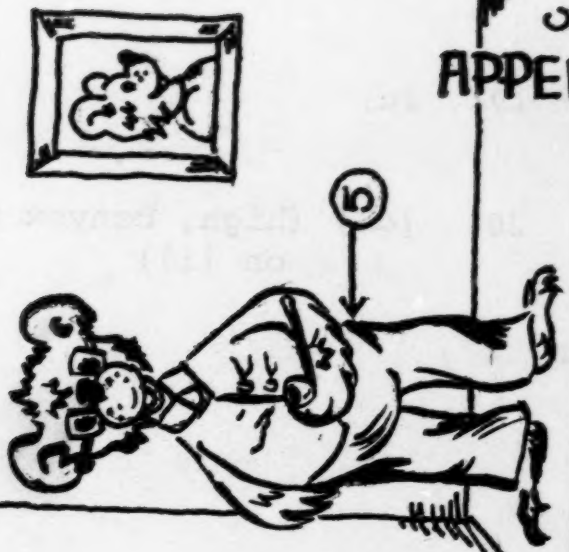
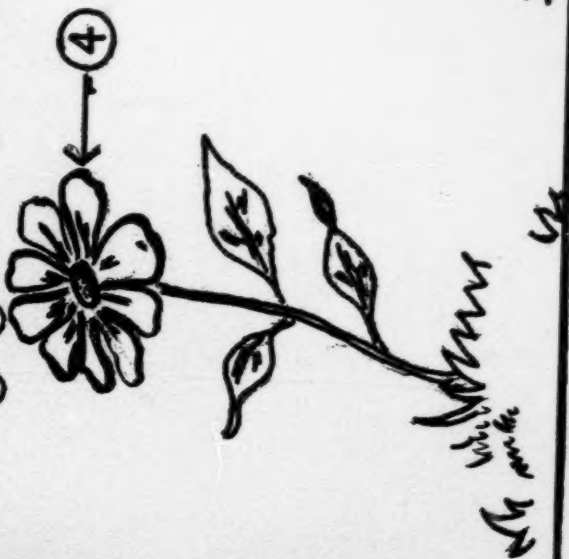
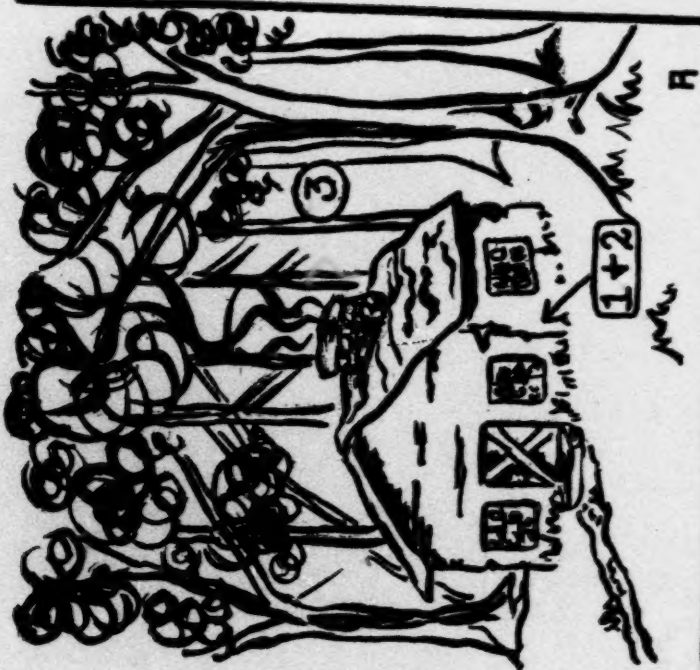
19. [u]

17. capital
20

20. [a1] (high, convex tongue
on [1])

End of Part II of Production

Visual Cues Correlated
with Language Production Test



APPENDIX D

